A proposal for rare plant rescue: *Zanthoxylum paniculatum* Balf. fil. (Rutaceae), endemic to Rodrigues

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"As regards the history of its flora, the island of Rodriguez bears a striking resemblance to St Helena. We read of the latter island that fire, goats, and finally introduced foreign plants well nigh exterminated the indigenous flora; and the same causes, I regret to say, are still operating in Rodriguez."

I. Bayley Balfour, D. Sc., F.L.S. Read on the 1st of February, 1877 to the Linnean Society in advance of a more complete account published as *Botany of Rodriguez* in 1879. (Balfour 1877).

Introduction

The island of Rodrigues lies 574km east of Mauritius at 63° 30'E, 19° 40' S (Strahm 1996), in the western Indian Ocean. With Mauritius and Reunion it forms the Mascarenes group; a trio of young volcanic islands, the oldest of which has been dated to 7.8MY by potassium argon dating (McDougall *et al* 1965, in Strahm 1996). Rodrigues, the youngest at 1.5MY, is also the smallest and driest of the three islands. Approximately the same size as the UK Channel Island of Jersey, Rodrigues covers an area of 109 sq km, reaches 393m in height, and has a mean coastal temperature of 24°C (75.2 °F) (Strahm 1996). Today the population depends largely on subsistence farming and fishing, with tourism playing a far less significant role in the economy than is found with the island's neighbour, Mauritius. The hillsides are dominated by steep terraces used to grow maize, chillies, citrus and root vegetables, or are grazed by pigs, sheep, goats and cattle, the sparsely vegetated hills occasionally interrupted by clumps of screwpine (*Pandanus heterophylla*), particularly on the dry south eastern flanks. Despite the extreme degradation of the island's vegetation since its colonisation by humans in the 16th century, six endemic genera and 145 indigenous species (of which 49 are endemic) still survive in Rodrigues (MWF 2005).

In his *New Voyage to the East Indies* published in 1708, Leguat describes Rodrigues as an "earthly paradise [where] we could hardly take our eyes off from [sic] the little mountains of which the island entirely consists; they are so richly spread with tall and great trees" (Leguat 1708). It is to this description that Balfour, in 1877, so woefully compared the vegetation of Rodrigues. At this time, as a member of the Transit of Venus Expedition and less than 200 years after Leguat's visit, Balfour records an "exceedingly fragmentary flora" with only a few species "confined to the more unfrequented and less accessible places." Amongst the species descriptions published on Balfour's return is that of *Zanthoxylum paniculatum* Balf. fil., a rarity even then.

Zanthoxylum paniculatum **Balf. fil. In: *J. Linn. Soc.* xvi (1877) 12**

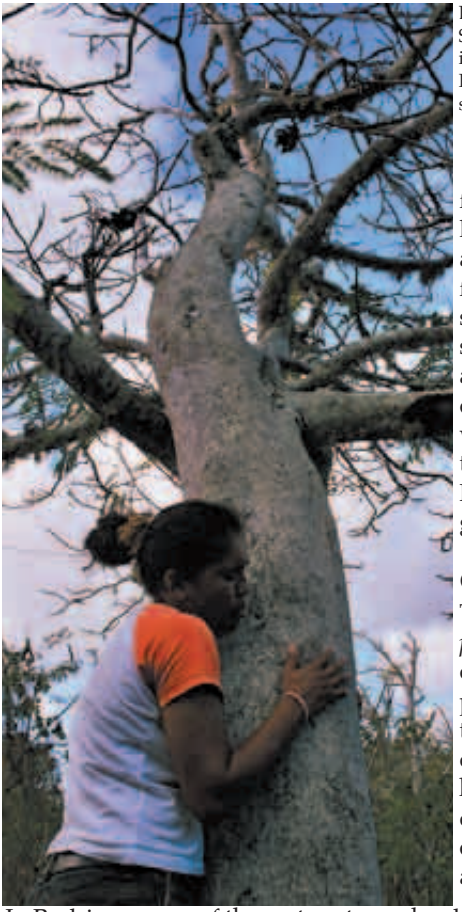
In the Mascarenes, *Zanthoxylum* (Rutaceae) is represented by two species, *Z. heterophyllum* (Lam.) Smith and *Z. paniculatum*. The former was once found throughout the Mascarenes but is now extinct in Rodrigues and IUCN Critically Endangered in Mauritius, where fewer than 40 individuals survive in the wild. In Réunion this species is found in greater numbers. In a simple key, Baker (1877) distinguishes the two species by the number and shape of the mature leaflets. As the name suggests, *Z. heterophyllum* also has a distinctive juvenile phase in which up to 60 leaflets are borne on a long rachis, the leaves being much smaller than the adult form, with distinctive gland dots (Baker 1877).

Z. paniculatum is one of the 49 endemic plant taxa still found growing in Rodrigues (MWF 2005). When Balfour first described this species in 1877 he noted that only two or three specimens were seen in "Quitore", the only locality where this species was found (Balfour 1877). Later, in *Botany of Rodriguez*, he records having seen "one or two trees of this near the shore of Anse Quitorze" (Balfour 1879), where two mature individuals remain today.

Anse Quitore is now a nature reserve managed by the Mauritian Wildlife Foundation (MWF) Rodrigues team, headed by Conservation Manager Mr Richard Payandee. Clearance of exotic species and planting of natives is currently underway as staff from the Forestry Department work with guidance from Ms. Anjeta ShanYU, from MWF Rodrigues. Mature trees of *Cassine orientalis* Kuntze (Celastraceae), the endemic palm *Latania verschaffeltii* Lemaire and tree araliad *Gastonia rodriguesiana* Marais (see illustration on p. 59), can be seen here within the confines of the steep valley sides, sheltering recent plantings of *Myoporum mauritianum* A.D.C. (Myoporaceae) and *Hyophorbe verschaffeltii* (Arecaceae) H.A. Wendl., amongst others. On the open corallitic plains above, *Lantana camara* L. dominates the landscape, with a solitary *Gastonia* in the distance towards the runway of the island's airport.

Visitors to Anse Quitor last saw *Z. paniculatum* flowering in the 1970s (ShanYU *pers. comm*.) and it was during this decade that seeds were collected and sent to RBG Kew for propagation. One tree (accession 1974-192) is held in the living collections amongst many other Critically Endangered Mascarene taxa, such as *Ramosmania rodriguesii* DD Tirvengadum, *Nesocodon mauritianus* (I. Richardson) Thulin, and *Scyphochlamys revoluta* Balf fil. A young tree was also recently discovered in the wild, in close proximity to the two mature trees, by Mr Richard Payandee (Payandee, *pers. comm*.) and perhaps this too originated from that last known period of flowering.

At the Mauritian Wildlife Foundation's Ile aux Aigrettes (IAA) nursery in the South East lagoon of Mauritius, *Zanthoxylum heterophyllum* seed has been germinated successfully by sowing in fine compost on an open bench where temperature ranges from 19 to 27°C (66 to 81°F). Under these conditions a few seeds germinated within ten days, but others continued to germinate over a



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Left: *Zanthoxylum paniculatum* with Anjeta ShanYU, the horticulturist and conservationist who looks after the Anse Quitor reserve, Rodrigues, where Balfour first described the species.

four month period. (This particular batch was cleaned and dried and then stored in a domestic fridge for three months prior to sowing). Based on this experience, should *Z. paniculatum* flower again, hand pollination, subsequent seed collection and sowing would be the most desirable way to propagate this species.

In lieu of this the following propagation methods are proposed:

Cuttings

To date, attempts to propagate *Z. paniculatum* by air layering and cuttings have failed. This may partly be due to the poor state of the two mature trees, which are currently dropping leaves and hold a lot of dead wood in their crowns, or it may also be that only one method of rooting was attempted.

In Rodrigues, one of the mature trees should be pruned towards the end of the dry dormant season in an effort to regenerate it. Cuttings should be taken from new juvenile material later in the following growing season. These cuttings will have a far greater capacity to form roots than any cuttings taken from the old mature wood.

In Mauritius, material of *Z. heterophyllum* should be collected where possible and a trial initiated, again using juvenile material. The appropriate rooting hormone should be applied before striking the cuttings and placing them in a mist bench, closed case or shade tunnel. Seradix 1-3 rooting hormone powders are available in Mauritius and mist benches are in operation in at least two nurseries managed by plant conservation agencies there.

Collection of material will be dependent on availability as this species is also extremely rare. Where possible material should be collected from cultivated stock, which may involve approaching conservation agencies in Reunion to

Gastonia rodriguesiana, at Anse Quitor reserve, Rodrigues (see page 57)

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discuss a collaborative project and exchange of materials. Accurate nursery records will be essential throughout the trial to ensure that material from Réunion is not confused with Mauritian stock, leading to pollution of the Mauritian populations at a later stage (i.e. during translocation/ reintroduction work). During the collection of material for both trials, great care should be taken to ensure that secateurs and knives are sterilized when moving from one plant to another, to prevent the spread of disease.

Results of this trial can then be used to secure a potential propagation protocol for *Z. paniculatum* and simultaneously determine the most successful way of propagating *Z. heterophyllum*. In Rodrigues, a trial based on the same methodology should be designed using material of *Z. paniculatum*. Although only two mature trees are known they are both large enough to provide material for a small trial.

Grafting

If cuttings are not successful for *Z. paniculatum*, for example because of a lack of healthy vigorous material, it may be possible to provide such material by grafting *Z. paniculatum* on to *Z. heterophyllum*. Assuming the grafts are successful, this would also be an immediate way of safeguarding the genotypes of the last remaining individuals.

Rootstock

The Red Data Book for Rodrigues lists Jardins Botanique de Nancy as the only *ex situ* collection of *Z. heterophyllum* held by a botanical garden (Strahm 1989). A search should be carried out through Botanic Gardens Conservation International's (BGCI) current database and by contacting plant conservationists within the Mascarenes.

The seed grown plants held in the IAA nursery (Mauritius) are too small to use for rootstocks but, if no other material can be found, one or two individuals from each seed batch could be reserved to grow on for this purpose.

The graft

Once rootstocks are secured, scions of *Z. paniculatum* could be collected and dispatched to Mauritius. Expert grafting is regularly performed by the Ministry of Agriculture's team of professional horticulturists. Permission could be sought for the work to be carried out at one of the Ministry's research stations, or alternatively, at one of the nurseries run by plant conservation agencies, such as the Mauritian Wildlife Foundation or the National Parks and Conservation Service (NPCS).

Rootstock material could also be dispatched to Rodrigues where scions of *Z. paniculatum* would be grafted at a nursery, such as that of MWF Rodrigues at Solitude.

Record keeping

Accurate and detailed records should be made of any information perceived to have an effect on the success of the graft, for example: the amount of time the material was in transit, the condition of the material on arrival, whether a rooting hormone was used, health of the material, and type of graft.

The new material

If the grafts are successful, they should be grown on until sufficient material is available for cuttings. If a suitable method has not already been determined, using the *Z. heterophyllum* work, a trial can now be carried out for this species. Great care should be taken to ensure that the stock plants are accurately labelled in the nursery and that no seeds are collected from the grafts, unless as result of a controlled breeding programme, whereby *Z. paniculatum* flowers are entirely isolated from those of *Z. heterophyllum*. It is likely that these species are closely related and may hybridise. Also the stock plants must not be planted in Mauritius. Once adequate material has been produced, all *Z. paniculatum* should be repatriated to Rodrigues and the grafts destroyed, to prevent any risk of them being planted in Mauritius.

In Rodrigues, translocation to the site of origin is feasible as Anse Quitor already has reserve status and is undergoing considerable restoration work.

Kew material

The *Z. paniculatum* plant held by the Royal Botanic Gardens Kew is a unique genotype and therefore very significant to this project. It is however, a small single-stemmed tree unsuitable for the production of large scions. Budding is routinely used to graft *Citrus* and has been suggested as a way of duplicating this specimen assuming suitable rootstock can be found (Alvarez, *pers. comm*.).

Action should be taken to source other tropical *Zanthoxylum* species that could prove compatible, and this material could also be used for cutting trials, in support of those undertaken in the Mascarenes.

Conclusion

As well as hopefully saving this Critically Endangered endemic species from extinction, the work proposed here would have several other positive outcomes:

•Strengthen links and communication between conservation agencies within the Mascarenes, which could be used as a pilot collaboration for similar species focused projects (cf: The Toromiro Management Group, Easter Island).

•Maximize the use of *ex situ* collections and expertise held by botanical gardens.

•Provide opportunities for training in grafting techniques for staff in Rodrigues.

•Engender optimism in those who face the daunting task of preventing the extinction of species and restoring habitats to the "earthly paradise" described by Leguat (1708).

•Raise awareness of plant conservation issues in the local community due to the cultural significance of the subject (an endemic species "rare plant rescue" project managed by local practitioners, both within Rodrigues, and elsewhere in the Mascarenes).

ACKNOWLEDGEMENTS

I would like to express thanks to the dedicated staff and volunteers at MWF Rodrigues who made my visit to Rodrigues so worthwhile and offer such encouragement to others working in this field, in particular Richard Payandee and Anjeta ShanYU.

REFERENCES

ALVAREZ, N. (2004). *Personal communication*. Noelia Alvarez manages the Temperate Nursery at RBG Kew, where she is responsible for curation of a collection of Mascarenes species, including *Z. paniculatum*.

BAKER, J. G. (1877). Flora of Mauritius and the Seychelles; a description of the flowering plants and ferns of those islands. L. Reeve & Co. London.

BALFOUR, I. B. (1877). Aspects of the Phaenogamic Vegetation of Rodriguez, with descriptions of new plants from the Island. *J. Linn. Soc.* xvi (1877) 12.

BALFOUR, I. B. (1879). Botany of Rodriguez. Royal Botanic Garden, Edinburgh.

LEGUAT (1708). A New Voyage to the East Indies. English translation. London.

MWF (2005). www.mauritian-wildlife.org/rodrig.htm. Accessed 12/01/2005.

PAYANDEE, R. (2004). *Personal communication*. Richard Payandee is the Rodrigues Conservation Manager for the Mauritian Wildlife Foundation.

SHANYU, A. (2004). *Personal communication*. Anjeta ShanYU is a horticulturist and conservationist working for the MWF Rodrigues team, currently coordinating work in the Anse Quitor Reserve of south west Rodrigues.

STRAHM, W. (1989). Plant Red Data Book for Rodrigues. IUCN.Koeltz Scientific Books. W. Germany.

STRAHM, W. (1996). Curtis's Botanical Magazine Vol. 13 Part 4, November 1996.

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